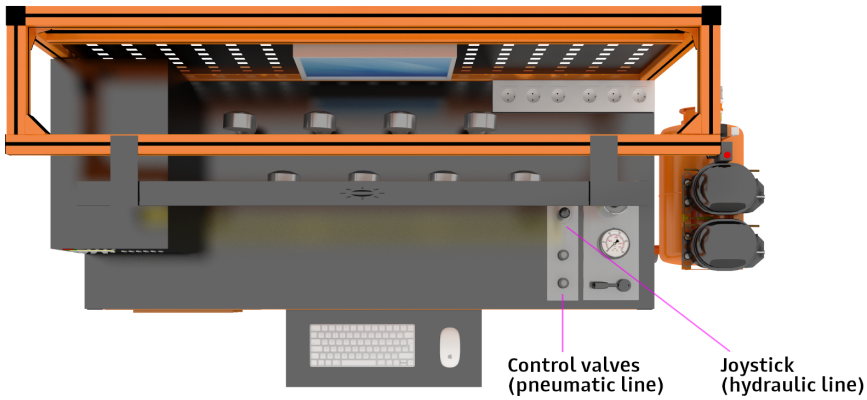
Alfapascal

Metrological test benches with automated pressure generation



Description of benches

Production of metrological test benches for verification, calibration, repair of pressure measuring instruments is a result of many years of our experience in the development and production of reference pressure standards. These benches are a ready-made workplace equipped with all necessary equipment to solve the metrologist tasks.

The uniqueness of our benches in comparison with existing analogues lies in the use of automated pressure generation sources in the range from minus 0.1 MPa to 60 MPa and high-precision reference pressure standards (including secondary state reference standards) of own design and production. In Russia none of the bench manufacturers have such kind of capabilities.

Benches produced by LLC “Alfapascal” have a typical modular design and use serially produced components as much as possible, due to which they cost less but not at the expense of functionality degradation.

All technical devices included in the bench are certified in accordance with the established procedure and have a complete set of documentation.

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Intended use

— Verification, calibration, leak testing of technical, reference and electric-contact pressure gauges, pressure sensors, precision digital pressure gauges, calibrators and pressure controllers, pressure switches, draft gauges, head flow gauges and draft-and-head gauges, including oxygen measuring devices or devices preventing the ingress of the liquid;
— accuracy classes of instruments on test: 0.008 and lower;
— automatic calculation of the calibration result (pass/fail), creation of calibration record data sheets by using software, database management of tested devices.

Highlights

— Instead of pressure controllers, automated pressure generation sources from -0.1 to 60 MPa of our own design adapted to contaminants, are used;
— no clean air conditioning required for benches with pressure controllers;
— all piping is made under the bench countertop for maximum use of the workspace and aesthetic comfort;
— separate pneumatic and hydraulic pressure lines;
— simple and intuitive controls;
— supplied fully assembled and ready for use, no commissioning required;
— own development and production of automated sources of pressure creation and standards allows us to get low cost, reasonable and reliable design, operational and competent technical support.

Technical solution

The possible technical solutions and devices included in the bench are described below. Specific equipment set is selected on the basis of the tasks faced by the Customer and agreed with him.

1. Bench Basis

The bench is based on a frame with automated pressure generation and distribution systems installed in it: hydraulic (pressure generation range 0... 60 MPa, working medium - oil or water) and pneumatic (versions 0... 2.5 MPa, -0.1... 2.5 MPa and 0... 40 MPa, working medium - air). The frame is made of high-strength metal profile and can withstand loads of up to 200 kg
The following items are installed on the frame:
— countertop with antistatic coating, resistant to mechanical and chemical effects with mounted racks for installation of reference and devices on test;
— LED lighting of the working surface with height adjustment of the luminaire;
— hanging cabinet for tools & documentation storage;
— electrical panel with sockets;
— rear perforated wall for tool hangers, trays;
— bench power panel;
— environmental parameters meter (pressure, temperature, humidity).

2. Automated Pressure Generation Sources

GSKA

The basis of automated pressure generation and distribution systems are the modules of GSKA and PSKA systems manufactured by our company in a special integrated version for installation on benches. GSKA and PSKA are unique automated pressure generation systems that have no rivals in their class, repeatedly tested for calibration tasks, reliable and significantly increasing labor productivity. Based on the examination results of the FBU “Rostest-Moscow” and the Main Scientific Metrology Center of the Ministry of Defense of the Russian Federation, the GSKA and PSKA systems were awarded the Gold Medal for innovative development.

Automated hydraulic pressure generation and distribution system consists of four main units: joystick, control panel, power unit and racks for the installation of reference device and devices on test. These units are connected by low pressure pipeline, high pressure pipeline and data cables. Pressure generation is carried out by the power unit. For ease of layout at the workplace, the power unit designed as a floor-standing version. Operation control of the power unit: pressure increase and decrease is carried out by the means of a joystick (forward - increase pressure, backward - decrease pressure). Pressure generation speed depends on the force of pressing the joystick. On the control panel there is a bowl for working medium with a pressure relief valve, a switch of rapid pre-filling mode of the system and smooth control of pressure, electric contact pressure gauge to protect the system from erroneous excess pressure, emergency shutdown button. For maximum use of the bench work space, the control panel is recessed in the countertop so that its

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top cover is on the same level as the countertop. Benches for installation of the reference device and devices on test are located in a row in front of the operator. Each rack is equipped with a set of adapters for various threads of the reference device and devices on test. All connecting pipelines are located under the countertop for maximum use of the workspace.

2.1. Automated pneumatic system of pressure generation and distribution has three options of execution depending on the task performed and wishes of the Customer:

— pressure generation range 0...2.5 MPa;
— pressure generation/discharge range -0.1...2.5 MPa;
— pressure generation/discharge range -0.1...45 MPa.

Depending on the version, PSKA consists of:
Option 1 — low-noise laboratory compressor K-25, precision control valves for pressure supply to the racks used for the installation of reference device and devices on test, racks for the installation of reference device and devices on test located in a row in front of the operator. Each rack is equipped with a set of adapters for various threads of the reference device and devices on test. For maximum use of the working space, the valves are integrated in the countertop, all connecting pipelines are located under the countertop, the compressor designed as a floor-standing version.

Compressor K-25

Precision pressure control valves

Option 2 — low-noise laboratory compressor K-25, low-noise vacuum pump VE-115, pressure/vacuum switch, precision pressure control valves for pressure supply to the racks used for the installation of reference device and devices on test, racks for the installation of reference device and devices on test located in a row in front of the operator. Each rack is equipped with a set of adapters for various threads of the reference device and devices on test. For maximum use of the working space, the valves are integrated in the countertop, all connecting pipelines are located under the countertop, the compressor and vacuum pump are floor-mounted.

Compressor K-25

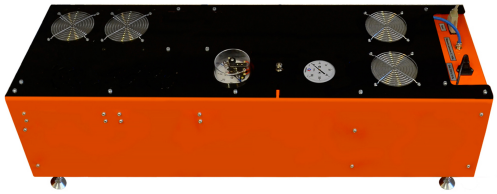
Vacuum pump

Precision pressure control valves

Option 3 — low-noise laboratory compressor K-25, low-noise vacuum pump VE-115, electropneumatic pressure increaser K-450, pressure/vacuum switch, precision pressure control valves for pressure supply to the racks used for the installation of reference device and devices on test, racks for the installation of reference device and devices on test located in a row in front of the operator. Each rack is equipped with a set of adapters for various threads of the reference device and devices on test. For maximum use of the working space, the valves are integrated in the countertop, all connecting pipelines are located under the countertop, the compressor, vacuum pump and electropneumatic pressure increaser are floor-mounted.

Compressor K-25

Vacuum pump



Electropneumatic pressure increaser K-450

Precision pressure control valves

If necessary, sources of pressure generation above 60 MPa, equipment for pressure measuring instruments calibration of oxygen version or preventing liquids and other substances from getting inside, are additionally supplied.

3. Reference Pressure Standards

MP and MGP measuring deadweight tester systems with load sets

MP and MGP measuring deadweight tester systems with load sets.
— Accuracy class 0.005; 0.01; 0.02; 0.05.
— Measuring ranges: from minus 0.1 MPa to 250 MPa.

Measuring deadweight tester systems (IPS) of deadweight gauges have no analogues in accuracy and stability of measurements and are used for calibration of all measuring instruments: any pressure gauges and pressure sensors, precision calibrators, controllers, digital pressure gauges, etc. of accuracy classes 0.008 and lower.
The production of these reference pressure standards for high performance is subject to special requirements: Piston and Cylinder Unit IPS is made of tungsten carbide, which significantly increases wear resistance, reduces the influence of temperature on the measurement results and eliminates the appearance of corrosion and the effect of “aging” material changing its properties, sets of loads are made of non-magnetic stainless steel to eliminate corrosion and influence of magnetic fields on the measurement result.

The main advantage of IPS in comparison with digital measuring instruments is the normalization of measurement error in a wide range from the measured value, not from the upper limit of measurement, which allows one IPS to provide calibration of instruments with different measurement ranges.
Measuring ranges of IPS range from minus 0.1 MPa to 250 MPa, which overlaps the most common pressure range in industry. Possible working medium — oil or water for IPS MP and air (atmospheric or from a cylinder, compressor) for IPS MGP. When checking digital measuring instruments to save budget and workplace without compromising the convenience of operation, it is possible to use one universal set of loads for several IPS together with special software “GPM Calculator”.

Pressure gauge PDE-020I

Reference digital converters PDE-020/PDE-020I, reference pressure modules Metran-518
— Accuracy classes 0.02; 0.03; 0.05; 0.1.
— Measuring ranges: from minus 0.1 MPa to 60 MPa

PDE-020/PDE-020I/Metran-518 are used for calibration of technical and standard pressure gauges, as well as pressure sensors and digital pressure gauges of accuracy classes not higher than 0.075. The modules have up to four measuring sub-ranges, when switching to those the accuracy class is preserved, so that one module can provide calibration of instruments with different measuring ranges. The devices have a communication interface with the PC and a standard software with automatic detection of the calibration result (pass/fail), printing of the calibration protocol, management of databases of the measuring instruments on test.

Pressure gauge DM5002M

Reference digital pressure gauges DM5002M-A
— Accuracy classes 0.06; 0.1; 0.15; 0.25.

— Measuring ranges: from minus 0.1 MPa to 250 MPa

DM 5002M-A are used for calibration of technical and standard pressure gauges, pressure sensors of accuracy classes not higher than 0.25. The pressure gauges have up to four measuring sub-ranges, when switching to those the accuracy class is preserved, so that one pressure gauge can provide calibration of instruments with different measuring ranges.

The devices have a communication interface with the PC and a standard software with automatic detection of the calibration result (pass/fail), printing of the calibration protocol, management of databases of the measuring instruments on test.

4. Auxiliary Equipment

Measurement standards of output signals from devices on test

The following equipment options are used to measure output signals from devices on test: high-precision digital voltmeter and electrical resistance standard, current and voltage calibrators (portable or stationary), multifunction calibrators. Built-in power sources of calibrators or external sources are used to power the measuring instruments on test. If it is necessary to check the electric contact pressure gauges (ECPG), the unit of fixing the activation moments of the ECPG contacts is applied. Modems or communicators are used to work with devices that have a digital output signal.

Our company officially cooperates with the world's leading manufacturers of calibration equipment for electrical measurements: Fluke, Transmille, Keysight Technologies, GE, etc. Selection of standards for measuring output signals is carried out on the basis of a specific calibration task and individual wishes of the Customer.

The measurement standards of electrical signals can be integrated in the instrument panel located on the left side of the table or on the back of the bench.

5. Computer and software:

The package can include a PC monoblock with wireless keyboard and “mouse” (optional - another type of computer), laser printer (optional - MFP), software for automated registration of calibration results. The specific software model is selected depending on the type of reference standards and instruments on test.

Software functionality:

— input of parameters of the device on test and further storage of calibration results for each calibrated measuring instrument;
— simultaneous recording of the calibration results of several instruments;
— automatic reading of digital reference instruments, manual input of readings — when using a deadweight pressure gauge;
— automatic error calculation of the devices on test and the output of the calibration result - pass/fail;
— automatic generation of calibration protocols;
— import of protocols into an xls-format.

When deadweight tester systems are used as a reference standard, the software “GPM Calculator” is included to calculate automatically the generated pressure, load weights and impact of external factors on the measurement results.

Documentation:

— operating manual, passport for the bench;
— operating manuals, passports for technical devices that are included in the bench;
— certificates of calibration, type approval certificates of measuring instruments with a description of the type on the reference measuring instruments included in the bench.

Optional equipment:

— equipment for repair and radio installation works: soldering station, oscilloscope, multimeter, etc.;
— additional equipment of the workplace: cabinets, shelves, lamps, trays, rolling tables, instrument racks, documentation cabinets, etc.

To order the bench, please fill in a questionnaire that will help you to accurately describe your needs and allow us to choose the necessary equipment and configuration of the bench.

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